

CLAIMS

1. A method for finding a record of data in a record addressable location of memory using valid data keys comprised of a plurality of values associated with the record, said method further pointing to the location of related data for invalid data keys, the method comprising the steps of:

assigning index values to valid and invalid symbol values within an entire key set prior to receiving a first key;

receiving a key associated with a record of data stored in a memory having record addresses;

arithmetically compressing a key to a record index value;

if the key is valid, providing the record index value to the memory as an address, the record associated with the key being stored at the address;

if the key is invalid, pointing to a record index value in the area of associated record data; and

accessing the record of data in the memory.

2. The method of Claim 1, wherein the step of assigning index values includes the steps of:

dividing every key of a key set into a sequence of symbols;

5 counting each use of a symbol value within each symbol position of the key sets;

storing the count within a use count table;

assigning index values to each symbol value within a symbol position having a non zero use count; and

10 assigning index values to each symbol value within a symbol position having a zero use count equal to the index value of a non-zero use count symbol value most immediately following the zero use count symbol value.

3. The method of Claim 1, wherein the step of assigning index values includes the steps of:

dividing every key of a key set into a sequence of symbols;

5 counting each use of a symbol value within each symbol position of the key set;

storing the count within a use count table;

counting the number of non zero entries within a symbol position of the use count table;

10 determining a base value for the symbol position;

and

15 assigning to each symbol value with a non zero use count within a symbol position an index value equal to the count of the non zero entries from the beginning of the symbol position multiplied by the base value for the symbol position; and

20 assigning to each symbol value with a zero use count within a symbol position, an index value equal to the value of the non zero symbol position immediately following the zero use count symbol position.

4. The method of Claim 1, wherein the step of assigning index values includes the steps of:

dividing every key of a key set into a sequence of symbol positions;

5 counting each use of a symbol value within each symbol position of the key sets;

storing the count within a use count table;

counting the number of non zero entries within a symbol position of the use count table;

10 determining a base value for each symbol position; and

assigning to each symbol value within a symbol position, an index value equal to the base value for the symbol position plus the count of the previous non zero

entries from the beginning of the symbol position,
multiplied by the base value for the symbol position.

5. An apparatus for performing set and relational operations on associative memory use count tables, said apparatus comprising:

5 an associative set processor for carrying out set and relational operations;

a plurality of memory locations for storing the use count tables of this key records to be combined;

a result table memory location for storing a result of the set and relational operations.

6. The apparatus of Claim 5, wherein the associative set processor includes means for performing a union of a plurality of use count tables.

7. The apparatus of Claim 5, wherein the associative set processor includes means for performing an intersection of a plurality of use count tables.

8. The apparatus of Claim 5, wherein the associative set processor includes means for performing a mask operation on a plurality of use count tables.

9. The apparatus of Claim 5, wherein the associative set processor includes a table process counter for sequencing through all index values resulting from a sequence of set and relational operations.

10. A method for determining a maximum number of key records resulting from the union of a first and a second key record memory by performing the union of use count tables of the first and second key record memories comprising the steps of:

determining the sum of the use counts for each symbol position;

determining which symbol position contains a minimum sum of use counts; and

outputting the minimum sum of use counts as the maximum number of possible key records resulting from the union of the first and second key record memories.

11. The method of Claim 10, wherein the step of determining the minimum sum of use counts for each symbol position further includes the steps of:

5 comparing each symbol value of the first use count table to the corresponding symbol value in the second use count table; and

 storing a maximum use count value resulting from each comparison in a results table.

12. The method of Claim 11, wherein the step of determining which symbol position has a minimum sum of use counts further includes the steps of:

5 totalling the sum of the maximum use count values for each symbol value of each symbol position; and

 comparing all of the sums for each symbol position to determine the minimum sum value.

13. A method for determining a maximum number of key records resulting from the intersection of a first and a second key record memory, comprising the steps of:

5 determining the sum of use counts for each symbol position;

 determining which symbol position has the smallest sum value of use counts; and

 outputting the smallest sum value of use counts as the maximum number of key records resulting from the intersection of a first use count table and a second use count table.

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14. Method of Claim 13, wherein the step of determining the sum of use counts for each symbol position further includes the steps of:

5 comparing each use count value of the first use count table to the corresponding use count value in the second use count table to determine the minimum value at each symbol value position; and

 storing the minimum use count value from each comparison in a results table.

15. Method of Claim 14, wherein the step of determining which symbol position has a minimum sum of use counts further comprises the step of:

5 totalling the sum of the minimum use count values for each symbol position; and

comparing all of the sums for each symbol position to determine the smallest value.

16. A method for performing a mask operation between a mask table and a use count table comprising the steps of:
comparing the use count table to the mask table;
determining each non zero entry in the mask
5 table;

storing in a corresponding position of a results table the use count table entry for each non zero entry of the mask table;

10 storing in a corresponding position of the results table a zero for each zero entry of the mask table;

determining the sum of the resulting use counts for each symbol position;

determining the minimum sum value; and

15 outputting the minimum sum value as the maximum number of key record entries resulting from the mask operation.

17. A method of Claim 16, wherein the step of determining the minimum sum value of use counts for each symbol position further includes the steps of:

5 comparing each symbol value of the use count table to the corresponding symbol value in the mask table;
and

storing the use count value from each comparison with a non-zero mask value in a results table.

18. The method of Claim 17, wherein the step of determining the minimum sum for each symbol position further includes the steps of:

5 totalling the sum of the resulting use count values for each symbol position;

comparing all of the sums for each symbol position to determine the minimum sum value.

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